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cc: Mr. Hugh Green
Mr. Greenbank
Mr. Ruhl

INSTITUTE FOR FISHERIES RESEARCH
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ALBERT S. HAZZARD, PH.D.
DIRECTOR

ADDRESS
UNIVERSITY MUSEUMS
ANN ARBOR, MICHIGAN

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REPORT NO. 554

A CENSUS OF THE FISH POPULATION OF
PIKE LAKE NO. 4, OSCODA COUNTY

John Greenbank

Introduction

Pike Lake No. 4 was poisoned on August 6, 1939 by a field party of the Institute for Fisheries Research at the request of its owner, Mr. Hugh Green. The object was the complete removal of all existing fish, in order that the lake might be stocked with species of fish deemed to be better suited to the environment offered by the lake. The poor fishing returns that the lake had been yielding seemed to indicate that the various warm-water species of fish which were present were not making a very good growth.

A preliminary survey of the lake had been made, a few days previously, by David Shetter, Floyd Ames, and Edwin Cooper, to obtain data as to the volume of the lake and the water temperatures, so that the necessary amount of poison could be calculated.

The application of the poison and the picking up and enumerating of the fish were done by a party consisting of A. S. Hazzard, William Beckman, John Greenbank, David Shetter, Floyd Ames, Edwin Cooper, and Clark Hubbs.

The Lake

Pike Lake No. 4 is a private lake on the estate of Mr. Hugh Green, near Comins, Michigan. This lake had a surface area of 4.6 acres, at a relatively low water level. At this level its maximum depth was 18 feet, and its volume about 2,400,000 cubic feet. Although it is located in a sandy district, it has a considerable proportion of marl on its bottom, and the water is somewhat hard and alkaline. Two or three springs, with a total flow of about 150 to 200 gallons per minute, feed cool water into the lake, and the dissolved oxygen content of the deeper water of the lake was ample in early August. Hence it may be assumed that, with a certain amount of improvement, the lake could be made to carry a population of trout.

Poisoning

Seventy-five pounds of the powdered derris root (5% rotenone content) were applied. This is equivalent to a concentration, in the lake, of one part in two million, by weight. The powder was mixed to a thin paste with water, and was dumped into the lake from a rowboat, the boat being rowed in criss-cross lines across the lake.

Within 15 to 20 minutes after the first of the poison entered the water, small perch began to show on the surface in a dead or dying condition. No definite succession of species in dying could be ascertained. However, the sunfishes (i.e., pumpkinseed, rock bass, and large-mouth black bass) died somewhat sooner than did the minnows, mud minnows, and bullheads. A few fish were still dying for about two days after application of the poison.

Fish Census

As nearly as was possible, all dead fish were picked up for enumeration. Of the black bass, rock bass, pumpkinseed, yellow perch, northern pike, and bullhead, the length of each individual fish, except the young of the year, was measured and recorded. The numbers of the young of the year (fish hatched in the spring or summer of 1939) of these species were recorded. For all other species, counts only were made. The total weight of the fish of each species was recorded, with the exception that the fish of several of the smaller species were lumped as "forage fish." Scale samples of a large series of sizes of each of the game species were taken, so that the age groups can be set apart.

It is believed that a 100% kill was achieved, and that at least 95% of the fish were recovered (a very few dead fish were eaten by turtles or sea-gulls, and a few sank to the bottom and did not subsequently rise). Hence the enumeration which here follows may be considered to give a reasonably accurate census of the fish population of the lake.

Table

The accompanying table summarizes the fish of the lake. The first column gives the total number of each species recovered. The next two columns give, respectively, the number of young of the year and of all other age groups. The former number was obtained by adding the counted young of the year to the number whose measured lengths showed them also to be this year's fish.* The number of fish of all other age groups is

* The length frequency figures, by which this number was arrived at, are not given here. They are clear-cut enough, however, so that the numbers used cannot be very much in error.

simply the difference between the total number and the number of young of the year.

Length ranges are given both in millimeters and in inches. The length here is understood to mean the total length of the fish. Total weights, by species, are given in pounds and ounces.

For each of the game species the total number of legal-sized fish is listed. This means, of course, all perch, rock bass, and pumpkinseeds over six inches, all black bass over ten inches, and all northern pike over fourteen inches. The last column in the table gives the number of daily limit catches for each of the game species, and is derived by dividing the number of legal-sized fish by the legal daily limit (i.e., by five for the black bass and northern pike, and by twenty-five for each of the other species).

Table

The Fish Population of Pike Lake No. 4

Species	Total Number	Number of Young of the Year	All Other Age Groups	Size Range, Millimeters	Size Range, Inches*	Total Weights, Pounds	Number of Legal Fish	Number of Daily Limit Catches**
Game Species								
Large-mouth Bass	371	287	84	35 - 348	$1\frac{1}{2}$ - $13\frac{1}{8}$	22.3	25	5
Rock Bass	663	321	342	23 - 196	1 - $7\frac{1}{8}$	15.5	32	1 $\frac{1}{5}$
Pumpkinseed	1,514	950	564	15 - 187	$\frac{1}{8}$ - $7\frac{1}{8}$	30.3	39	1 $\frac{3}{5}$
Yellow Perch	7,543	6,393	1,150	36 - 211	$1\frac{1}{2}$ - $8\frac{1}{2}$	65.1	265	10 $\frac{3}{5}$
Northern Pike	1	...	1	807	32	7.2	1	$\frac{1}{5}$
Totals							362	18 $\frac{3}{5}$
Non-Game Species								
Bullhead	145	18	127	37 - 300	$1\frac{1}{2}$ - 12	55.0		
Mud Minnow	2,306	...	...	...	...	7.2		
Darter	511	...	...	...	...	...
Black-nose Shiner	132	...	...	...	...	...
Black-chin Shiner	90	...	...	...	...	...
Horned Dace	2	...	...	...	...	...
Golden Shiner	2	...	...	...	...	...
Top Minnow	88	...	...	(Total of six species) --		1.5		
Totals	13,368					204.1		

* To nearest $\frac{1}{2}$ inch** To nearest $\frac{1}{5}$ daily limit

Figures

The two figures included in this report present the length frequency distributions of two of the game fish species, the large-mouth bass and the yellow perch. The age groups as designated are to be taken as only tentative, pending confirmation by scale readings.

Discussion

The total population (of thirteen species) of about 13,400 fish weighed 204 pounds. The area of the lake being 4.6 acres, the weight of fish thus is about 44 pounds per acre. In comparison with some other Michigan lakes, this may be considered to be fairly good productivity. From the standpoint of angling, however, the population of the lake was rather an undesirable one, because of its very large proportion of small fish.

Whether or not the fish were stunted cannot be stated until the age groups have been differentiated by scale reading and statistical treatment. In view of the large numbers of small fish, particularly of perch (the number of young of the year perch was almost half the total number of fish in the lake), it seems as if there may have been at least some stunting.

The total number of all legal-sized game fish was 362, of which over two-thirds (265) were perch. These perch were all under $8\frac{1}{2}$ inches, and only 51 of them were over 7 inches. Broken down into daily limit catches, these 362 legal fish totaled only (in round numbers) 19 limit catches. Thus* the lake would have afforded one day's fishing, with a limit catch, to each of 19 fishermen. And the best fish taken would have been one 7-pound northern pike, a 22-ounce large-mouth bass, some 7-inch rock bass

* Assuming the nearly impossible feat of catching all of the legal-sized fish in the lake.

and pumpkinseeds, and several 7- to $8\frac{1}{2}$ -inch perch. By almost any fisherman, this would be considered to be rather poor fishing!

It is evident, therefore, that the census of the lake definitely confirmed the assumption that the lake was very poor in good-sized game fish, and offered justification for cleaning out the lake and starting over.

Recommendations

In accord with suggestions made by Dr. Hazzard, the following recommendations for future treatment of the lake are submitted.

The springs should be cleaned out, and kept clean, in order to secure the maximum possible flow. Preferably the spring streams should be tiled. If tiling is installed, the outlet should be at a depth of one and a half to two feet under the surface of the lake. If these streams are not tiled, they should be provided with shade, in the form of trees or shrubs along their sides. Swamp cedars are suggested, as being suited to living in such a situation and because they furnish year-around shade.

Gravel piles should be installed at the outlet of the spring streams (or tiling), to serve as trout spawning areas. A few bushels of gravel, from the size of a pea up to an inch or so in diameter, would constitute a bed. The gravel should be placed in about two feet of water. If tiling is used, the gravel might be placed right over the tile outlet, so that the cold water would be forced through the gravel.

A few small brush shelters as described in Bulletin No. 2 of the Institute (The Improvement of Lakes for Fishing) might be placed in the vicinity of the spring stream entrances to offer shelter to the trout fry and protection to the spawning adults.

The dam at the lake's outlet should be kept high enough at all times, or else should be screened, so that no fish can enter the lake from below. The use of any kind of live fish for bait in the lake should be strictly prohibited. Since the fish management of this lake is to be partly in the nature of an experiment, it is essential that no species of fish except brook trout be introduced into the lake.

The lake should be planted this fall with about 500 fingerling brook trout per acre, or a total of about 2,000. Assuming a 20% loss following planting, there would be a surviving population of about 400 per acre. Future management of the lake should aim at replacing, by natural reproduction or planting, only as many adult fish as are removed by fishing. Too large a population would result only in crowding and stunting, since the lake has inherent productivity enough to keep only a certain poundage of fish in existence. For this reason it is essential that a careful record be kept of the fishing. This record can be kept in creel census books, which may be obtained from the Institute for Fisheries Research.

Cost Account

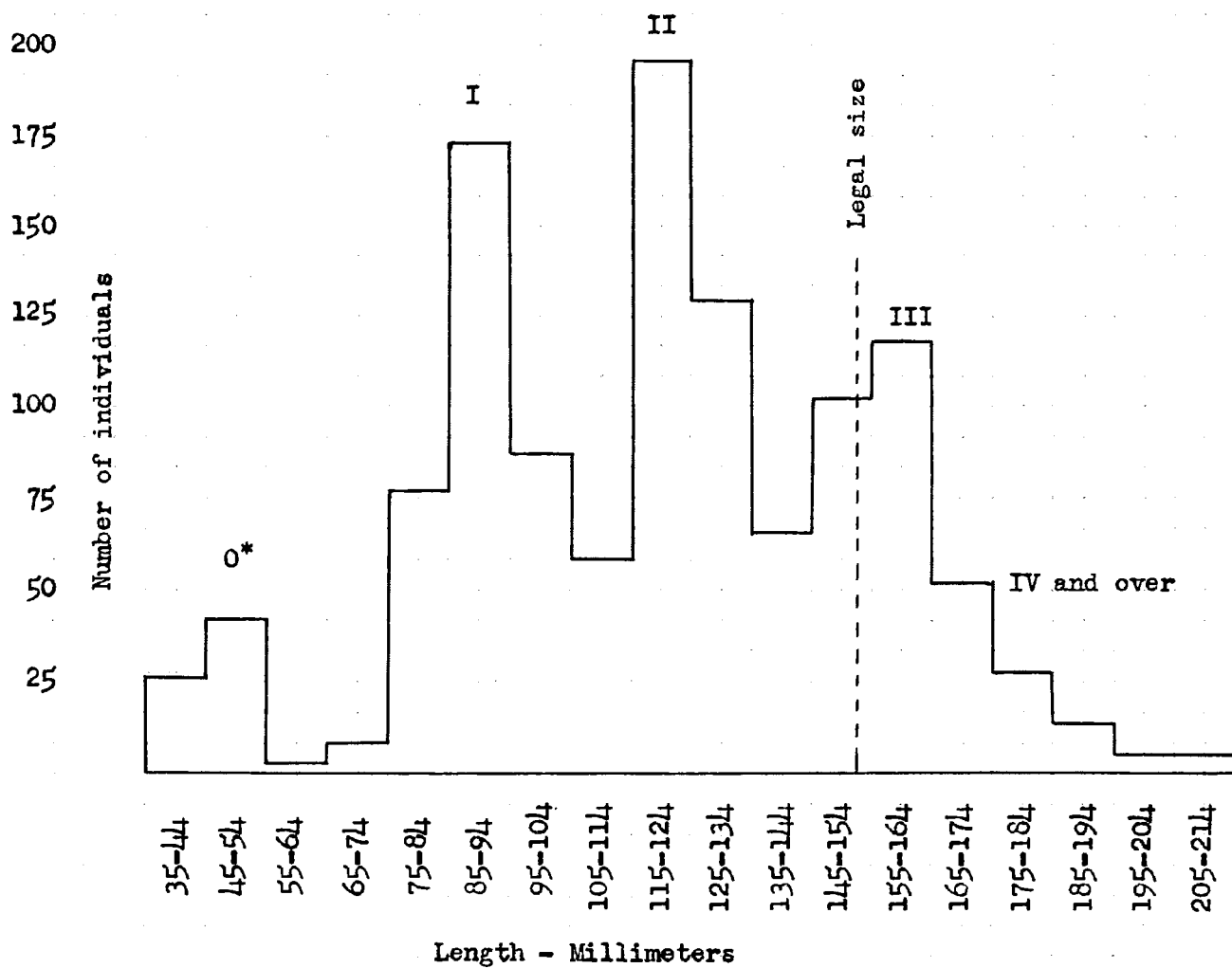
Seventy-five pounds of material were used. At an estimated cost of \$0.30 per pound, this amounted to \$22.50.

Labor was furnished by the Institute for Fisheries Research, in return for the privilege of making a population study of the fish, and no cost estimate of labor was made.

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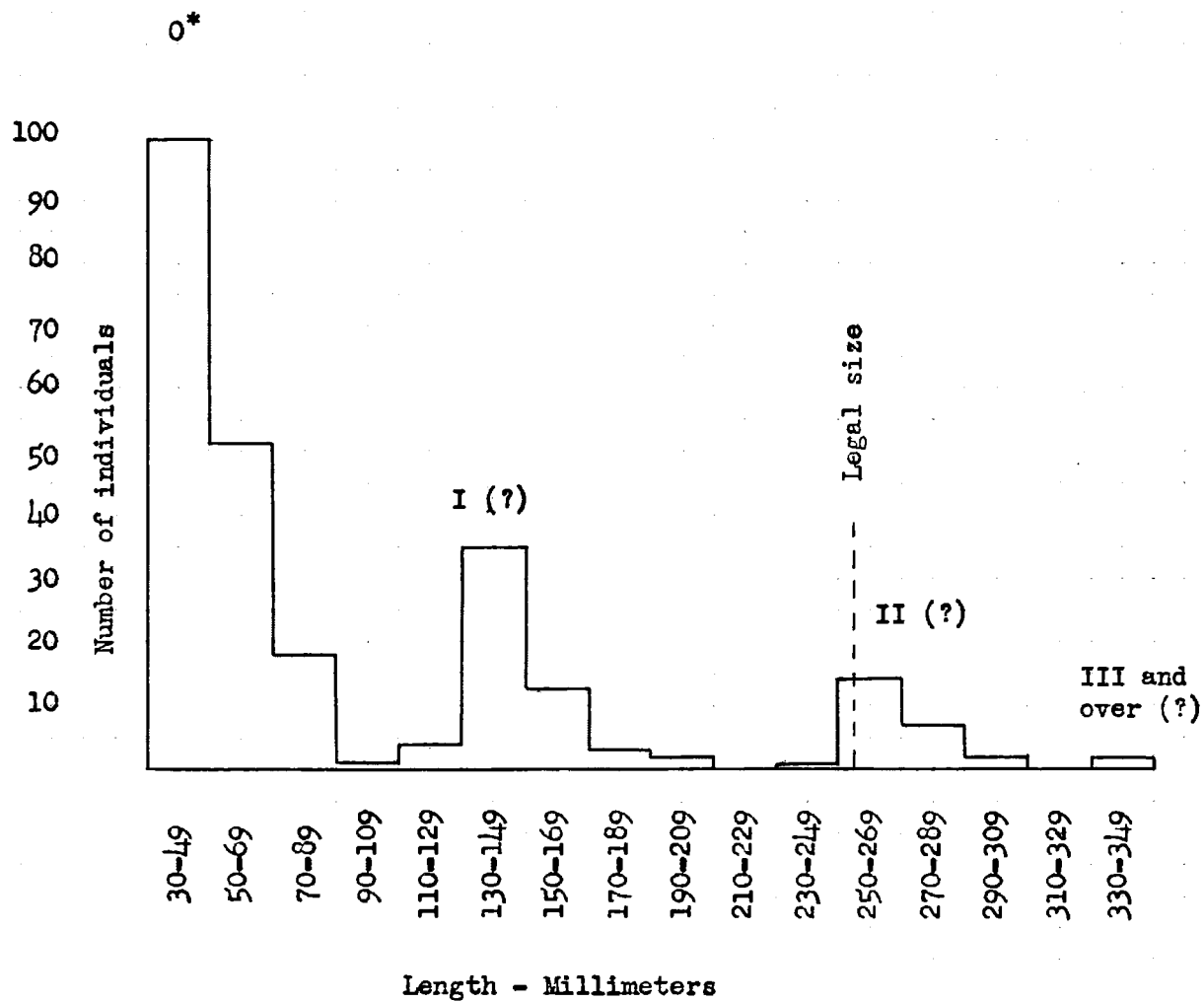
By John Greenbank

Figure 1. Yellow perch, length frequency distribution



* Zero class also includes 6323 unmeasured individuals

Figure 2. Large-mouth bass, length frequency distribution



* Zero class also includes 118 unmeasured individuals.